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(54) MOTOR DRIVEN PUMP

(71) We, PROCESS INDUSTRIES INCORPORATED, a corporation of Pennsylvania, whose post office address is Box 305, Huntingdon Valley, Pennsylvania, 19006, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to motor driven pumps having a magnetic coupling between the motor and the pump.

According to the present invention, there is provided a motor driven pump having a magnetic coupling between the motor and the pump, which comprises an electric motor having a shaft, a coupling housing, and an impeller housing all in mutual alignment; a fixedly mounted shaft member secured in said impeller housing and extending longitudinally in said coupling housing; a first magnetic unit within said coupling housing and having an impeller in said impeller housing connected thereto; a supporting bearing of said first magnetic unit journaled on said shaft member; a second magnetic unit within said coupling housing and in surrounding relation to said first magnetic unit; a supporting bearing of said second magnetic unit journaled on said shaft member; said second magnetic unit having flux producing windings therein, and including a rotatable carrier having a conductor ring connected to the windings and connectable with a source of electrical energy; an isolating sleeve intermediate said first and second magnetic units.

The invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a longitudinal central sectional view of a motor driven pump having a magnetic coupling, in accordance with the invention; and

Figure 2 is a transverse sectional view taken approximately on the line 2—2 of Figure 1.

Referring now more particularly to the drawings, an electric motor 10 is shown having a shaft 11 extending into an open end of a coupling housing 12 having an end flange 13 which is secured to the housing of the motor 10.

The coupling housing 12 has a generally cylindrical central portion 14 and an opposite end flange 15.

The end flange 15 has detachably secured thereto, by bolts 16, the flange 17 of an impeller housing 19. The impeller housing 19 has a fluid inlet 20 and a scroll 21 of well known type with a fluid delivery connection (not shown).

The impeller housing 19 has mounted in the inlet 20 a spider 22 with a central boss 23 with which one end 25 of a fixedly mounted shaft 24 is in threaded engagement.

The flanges 15 and 17 have interposed therebetween a mounting plate 26, which has a groove 27 therein receiving a packing 28, such as an O-ring, preventing fluid leakage from the impeller housing 19 at this location.

The mounting plate 26 has a central opening 29 at which a cylindrical isolating sleeve 32 is secured in fluid tight relation, by welding. The other end of the sleeve 32 is closed by a plate 33, also welded thereto. The sleeve 32 and plate 33 are of non-magnetic material, such as stainless steel.

The plate 33 has secured thereto, by welding, a fixed stub shaft 35. The stub shaft 35 has a cylindrical end portion 36, of reduced size, engaging in a complemental opening 37 in the shaft 24.

The stub shaft 35 also has a limit stop ring 38 fixed thereon, the ring having openings 39 for fluid circulation.

The impeller assembly includes a fluid impeller 40. The fluid impeller 40 has a cylindrical flange 41 for sliding movement

with respect to a complemental outer flange 42 on the spider 22 and has a rim 43 in overlapping relation to a flange 44 on the spider 22 to reduce leakage from the scroll 21 to the inlet 20.

The impeller 40 is detachably secured, by screws 45 through an impeller mounting plate 46 to a cylindrical magnetic responsive unit 49.

The magnetic responsive unit 49 includes a magnetic element 50 encased by interior and exterior cylindrical enclosures 51 and 52, closed at the ends by end closures 53 and 54, all the closing elements being of non-corrosive non-magnetic responsive material. A clearance space is provided between the enclosure 52 and sleeve 32 for fluid circulation.

The magnetic element 50 is of soft iron, or high intensity metallic or ceramic material, and with the desired number and arrangement of poles in accordance with the particular structural requirements.

The magnetic responsive unit 49 is mounted on a bearing sleeve 55 within which a cylindrical bearing 56 is provided. The bearing 56 is made of graphite or carbon, and is in bearing engagement with the fixed shaft 24. A helical lubricant circulating groove 57 is provided for return of fluid through a passageway 58 to the suction part of the impeller 40.

The stop ring 38 limits the movement along the axis of the shaft 24 of the magnetic responsive unit 49 and the impeller 40 towards the right as seen in Figure 1.

In surrounding relation to the magnetic responsive unit 49, and outside the sleeve 32, an electromagnetic driving unit 59 is provided which includes a plurality of flux producing windings 60 mounted on pole pieces 61 carried by a hollow cylindrical or cup shaped carrier 62.

The carrier 62 is journaled on a ball bearing 63 carried on the fixedly mounted stub shaft 35 and is connected to the motor shaft 11, by a key 64 and grub screws 65.

The carrier 62 has an end wall 66 on which a slip ring 67 with two electrically insulated conductor rings 68 and 69 is secured by screws 70. The conductor rings 68 and 69 are connected to the windings 60 for energization thereof, and brushes 71 and 72, connected by conductors 73 and 74 to a source of electrical energy, provide the desired flux pattern and intensity at the pole pieces 61.

The mode of operation will now be pointed out.

The conductor 73 and 74 are connected to a source of electric energy and through the brushes 71 and 72 and conductor rings 68 and 69 energize the windings 60 and pole pieces 61 to produce a flux pattern which couples with the magnetic element 50 to drive the magnetic responsive unit 49 and the impeller 40 connected thereto, upon rotation of the motor shaft 11.

The conductor rings 68 and 69, the brushes 71 and 72, and conductors 73 and 74 are all isolated from the fluid by the sleeve 32 and its end closure 33.

It will be noted that a portion of the fluid being pumped is available from the scroll 21 through the clearance space between the interior of the sleeve 32 and the enclosure 52 to the right end of the bearing sleeve 55 for return through the groove 57 and passageway 58 to the impeller 40. The fluid thus circulated serves to provide lubricating fluid to the bearing 56 as well as to carry off heat and aid in cooling the windings 60.

A pump having a simple but effective fluid isolating magnetic coupling is thus provided whereby the components are shielded and isolated from the fluid being pumped so as to avoid corrosion and short circuiting of the windings.

WHAT WE CLAIM IS:—

1. A motor driven pump having a magnetic coupling between the motor and the pump, which comprises an electric motor having a shaft, a coupling housing, and an impeller housing all in mutual alignment; a fixedly mounted shaft member secured in said impeller housing and extending longitudinally in said coupling housing; a first magnetic unit within said coupling housing and having an impeller in said impeller housing connected thereto; a supporting bearing of said first magnetic unit journaled on said shaft member; a second magnetic unit within said coupling housing and in surrounding relation to said first magnetic unit; a supporting bearing of said second magnetic unit journaled on said shaft member; said second magnetic unit having flux producing windings therein, and including a rotatable carrier having a conductor ring connected to the windings and connectable with a source of electrical energy; and an isolating sleeve intermediate said first and second magnetic units.

2. A motor driven pump as claimed in claim 1, wherein said first magnetic unit and said sleeve have a clearance therebetwen in communication with the impeller housing, and the supporting bearing of said first magnetic unit has a fluid return groove in connection with said clearance space and with the impeller for circulation of fluid within said sleeve for cooling.

3. A motor driven pump as claimed in claim 1 or claim 2 in which said sleeve has an end closure plate, and said shaft member includes a stub shaft to which said end closure plate is connected.

4. A motor driven pump as claimed in

any one of the preceding claims wherein said supporting bearing of said first magnetic unit is an elongated cylindrical member.

5. A motor driven pump as claimed in any one of the preceding claims wherein said supporting bearing of said second magnetic unit is a ball bearing.

6. A motor driven pump as claimed in any one of claims 3 to 5 as dependant on claim 3 wherein said supporting bearing of said second magnetic unit is carried by said stub.

7. A motor driven pump as claimed in any one of the preceding claims wherein a spider is provided in said pump housing, in which said fixedly mounted shaft member is carried.

8. A motor driven pump as herein described with reference to, and as shown in, the accompanying drawings.

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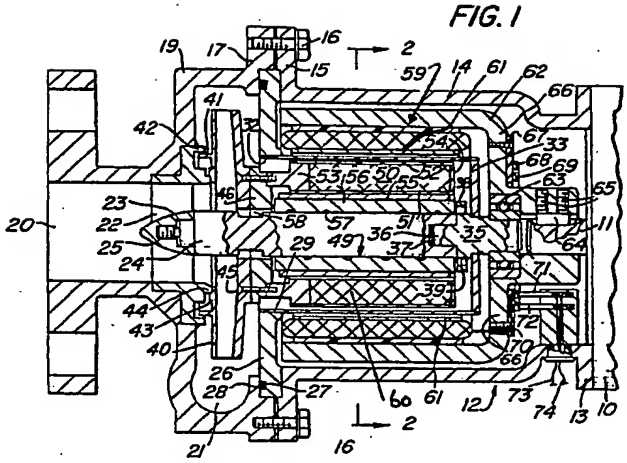
1260621 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1



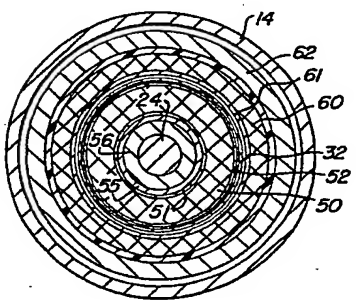


FIG. 2